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Assessment of Diesel exhaust particulate exposure and surface characteristics in association with levels of oxidative stress biomarkers

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The increase of exposure to PM_{10} and $PM_{2.5}$ (particulate matter with aerodynamic diameter smaller than 10 μm and 2.5 μm) has been found to be associated with a range of adverse health effects. Surface characteristics (chemical reactivity, surface area) are considered of prime importance to understand the mechanisms which lead to harmful effects. A hypothetical mechanism to explain these adverse effects of particulate matter is the ability of some components (organics, metal ions) adsorbed on these particles to generate reactive oxygen species (ROS), and thereby to cause oxidative stress in biological systems. ROS can attack almost any cellular structure, leading to the formation of a wide variety of degradation products which can be used as a biomarker of oxidative stress.

The aim of the present research project is to demonstrate an association between the exposure to Diesel exhaust particulate (DEP) and the oxidative stress status. For that purpose, a survey is conducted in real occupational situations where workers are exposed to DEP (bus depots). Several biomarkers of oxidative stress have been determined either in urine or serum of volunteers, and levels will be discussed in relation to exposure variables.

In order to bring some insight into the relation between the particulate surface characteristics and the formation of ROS by-products, different exposure variables have been considered:

- particulate number, distribution and surface (SMPS);
- particulate mass (gravimetry);
- elemental and organic carbon (coulometry);
- total adsorbed heavy metals (atomic absorption);
- surface functional groups present on particles (Knudsen flow reactor).

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